MT. SAN JACINTO COMMUNITY COLLEGE DISTRICT

ADDENDUM NO. 1

BID NO. 2021-003

OWNER-FURNISHED CHILLER REPLACEMENT

BUILDING 300 AT SAN JACINTO CAMPUS

SEPTEMBER 8, 2020

Owner:

Mt. San Jacinto Community College District

1499 N. State Street

San Jacinto, CA 92583

RECEIPT OF THIS ADDENDUM MUST BE ACKNOWLEDGED ON PROPOSAL WHEN SUBMITTED

QUESTIONS:

Q1. Please advise who the manufacturer of the existing BAS/controls system is so that we may properly coordinate with them?

A1. The manufacturer for the controls is Distech

Q2. Please provide information on the owner-furnished pump. No Specs/information is currently provided.

A2. The pump is 10 HP 230/460 volt

Q3. Please advise if the pump will need a VFD. If yes, will this be contractor furnished or owner furnished?

A3. The District does not have a VFD on the existing pump, so we will not need one

Q4. Please provide if a temporary chiller is required during the scope of this work?

A4. If there are no students on campus during the time that the work will be performed, we will not need a temp chiller. If students are back on campus then we will need to discuss the temp chiller further.

Q5.We need to remove the louver to bring in the new chiller. The louver currently has some piping and electrical lines running inside of it. Can we disconnect these items temporarily or do they service a function that must remain operational during the construction phase?

A5. The louvers will need to be removed and the pipes will need to be cut. The electrical is questionable. We feel the new chiller will fit without removing the electrical but this has to be verified.

Q6. Do we need to only perform water balance or is any air balancing required as well?

A6. No air balancing will be required.

Q7. Please provide technical specifications of the new chiller so that we may know the weight, water line sizes, etc.

A7. Please see attached specifications.

Q8. Please advise if the electrical requirements of the new chiller are the same as the existing chiller. If not, will new electrical lines to the panel be required?

A8. The electrical requirements for the new chiller should be the same as the old one unless the manufacturer has changed them.

Q9. Please provide specifications for insulation on the new chilled water piping.

A9. The pipe is 3 inch. And the thickness of the insulation is 1 ½ in.

GENERAL

Attachments:

Yazaki Brochure

Yazaki Guide Specifications

YAZAKI

Gas-Fired Double-Effect Chiller-Heater

CH-K Series: 30, 40, 50, 60, 80, 100 RT Cooling with Standard Heating Capacities

CFC

WE ARE FRIENDLY TO THE EARTH

Gas-Fired Double-Effect Chiller-Heater

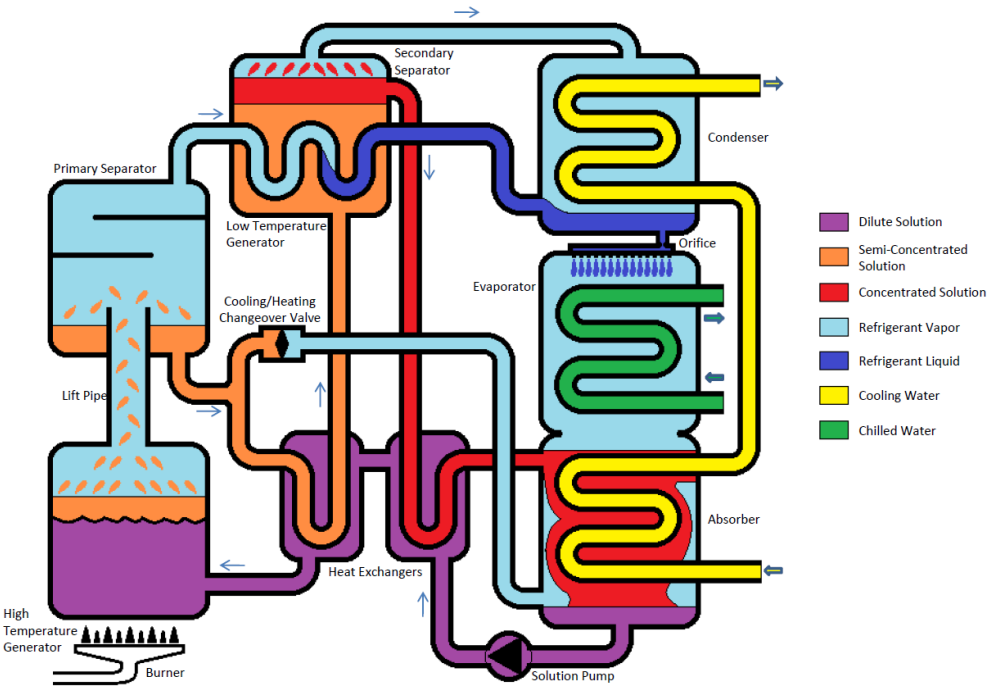
(For Commercial Applications)

Yazaki K-Series gas-fired double-effect chiller-heaters, with cooling capacities of 30 to 100 tons of refrigeration, are designed for commercial applications where chilled and hot water are used in a central air conditioning system. The condenser is water-cooled, and during cooling operation heat is rejected through a cooling tower or a ground loop.

Absorption Principle

Yazaki absorption chiller-heaters use a solution of lithium bromide and water under a very low pressure as the working fluid. Water is the refrigerant and lithium bromide is the absorbent. The double-effect absorption cycle has two generators, one directly heated by the gas-fired burner and the other heated by hot refrigerant vapor. Refrigerant, liberated by heat from the solution, produces a refrigerating effect in the evaporator when cooling water is circulated through the condenser and absorber.

Cooling Cycle



High Temperature Generator

The gas burner heats dilute lithium bromide solution in the high temperature generator and the boiling process drives the refrigerant vapor along with droplets of semi-concentrated solution up into the primary separator. The semi-concentrated solution is pre-cooled through a heat exchanger before flowing into the low temperature generator.

Low Temperature Generator

Hot refrigerant vapor from the primary separator heats the semi-concentrated solution in the low temperature generator. Refrigerant vapor released from this solution flows to the condenser while concentrated solution is pre-cooled through a heat exchanger before flowing into the absorber.

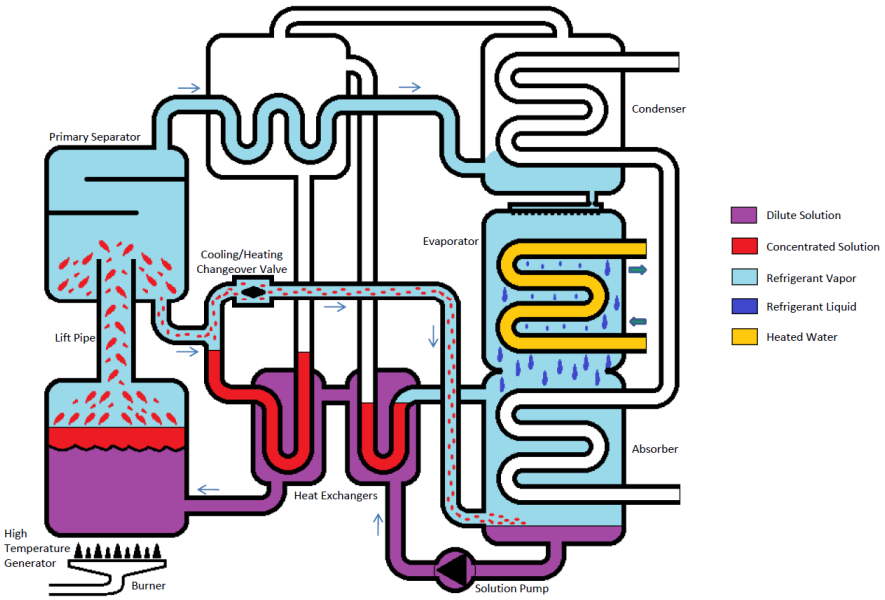
Condenser

Refrigerant vapor is condensed on the surface of the condenser coil and latent heat removed by the cooling water is rejected to a cooling tower, ground loop, or other heat rejection device. Refrigerant liquid accumulates in the condenser sump and then passes through an orifice into the evaporator.

Evaporator
Pressure in the evaporator is substantially lower than the pressure in the condenser due to the influence of the absorber. As the refrigerant liquid flows into the evaporator, it boils on the surface of the chilled/hot water coil. Heat, equivalent to the latent heat of the refrigerant, is removed from the recirculating water which is chilled to 44.6°F (7°C) at standard conditions. The refrigerant vapor flows to the absorber.

Absorber
A low pressure in the absorber is maintained by the affinity of the concentrated lithium bromide solution from the separator with the refrigerant vapor formed in the evaporator. The refrigerant vapor is absorbed by the concentrated lithium bromide solution as it flows across the surface of the absorber coil. Heat of condensation and dilution are removed by the cooling water. The dilute lithium bromide solution is pre-heated through the heat exchangers before returning to the generator.

Heating Cycle



High Temperature Generator
The solution boils in the high temperature generator in a manner identical to the cooling cycle. Refrigerant vapor and concentrated solution rise into the primary separator.

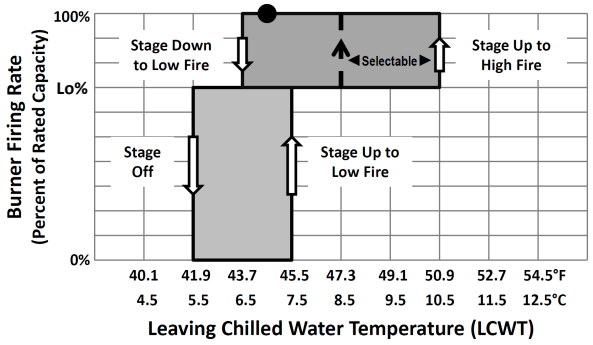
Evaporator
Hot refrigerant vapor and droplets of concentrated solution flow through an open cooling/heating changeover valve into the evaporator/absorber section. Some refrigerant vapor flows into the evaporator/absorber section via the condenser. Since the pressures in the evaporator and the condenser sections are similar and there is no cooling water flow, the hot refrigerant vapor condenses on the surface of the chilled/hot water coil. Heat equivalent to the latent heat of the refrigerant is transferred to the recirculating water which is heated to 131°F (55°C) at standard conditions.

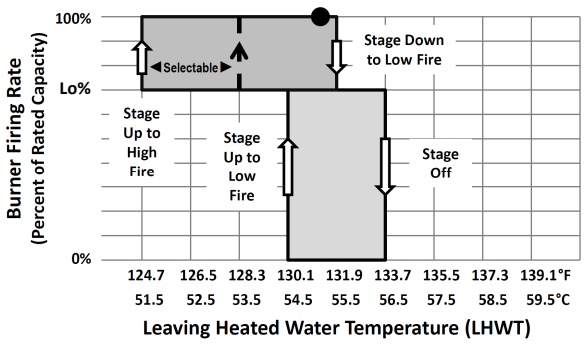
Absorber
Liquid refrigerant drips off the chilled/hot water coil into the sump to mix with the concentrated lithium bromide solution to form a dilute solution and is returned to the generator where the cycle is repeated.

Features

- "G" Series control package utilizing VFD solution pumps are used on the 30 to 80 ton chiller-heaters.
- Each modular chiller-heater serves a dual purpose: Cooling and Heating.
- Cooling or heating operation can be selected from a remote or built-in switch with a 30-minute changeover.
- A two pipe hydronic system can be used to circulate chilled or hot water to a central air handling unit or to multiple fancoils.
- Can be vented with inexpensive Double Wall Type B Vent using Category I rules.
- Vacuum vessel is hermetically sealed at the factory for a level of vacuum integrity that is unmatched in the industry, with no field welding necessary.
- Safe, odorless, non-toxic lithium bromide and water are the working fluids and operate under a vacuum at all times.
- Proprietary solution and inhibitor blends ELIMINATE the need for regular chemical analysis, resulting in much simpler regular maintenance when compared with other manufacturers.
- Only two moving parts – the solution pump and the burner blower – are needed. We don't use multiple pumps as some other manufacturers do, because we allow gravity to do the work for us.
- All field piping and wiring connections are conveniently located on the rear of each module.
- Built-in control panel with microprocessor control simplifies installation and maintenance.
- Safety shutdown for abnormal cooling water conditions is included in the logic of the microprocessor control.
- The DOUBLE-EFFECT absorption cycle and forced-draft burner reduce fuel consumption and require less heat to be rejected to the cooling tower, resulting in energy savings and a smaller required cooling tower size.
- UL Listed in the USA and Canada.
- Cabinets are UL50E Type 3R and are suitable for indoor or outdoor installation without modification.
- Each unit is run-tested at the factory prior to shipment. The factory trims and balances the solution concentration so you don't have to.
- Needs no back-up power source to prevent crystallization during a power failure, as gravity alone can handle it.

Performance Characteristics





Low Fire Sequence of Operation:
When LCWT rises to 45.5°F, the burner will fire at Low Fire. If the LCWT temperature continues to rise, the burner will stage up to High Fire at 50.9°F. Otherwise, the burner will shut down when the LCWT reaches 41.9°F.

High Fire Sequence of Operation:
When the LCWT increases to 50.9°F (adjustable to 47.3°F) the burner goes up to High Fire. It will continue to burn in High Fire until the LCWT reaches 43.7°F at which time the burner will drop back into Low Fire and again follow the Low Fire Sequence of Operation.

Low Fire Sequence of Operation:
When LHWT falls to 130.1°F, the burner will fire at Low Fire. If the LHWT temperature continues to fall, the burner will stage up to High Fire at 124.7°F. Otherwise, the burner will shut down when the LHWT reaches 133.7°F.

High Fire Sequence of Operation:
When the LHWT falls to 124.7°F (adjustable to 128.3°F), the burner goes up to High Fire. It will continue to burn in High Fire until LHWT reaches 131.9°F at which time the burner will drop back into Low Fire and again follow the Low Fire Sequence of Operation.

- ● - Standard Design Set Point. This is the temperature that will be held when load exactly equals rated capacity. Cooling Set Point can be adjusted 1.8°F down or 16.2°F up from standard set point. Heating Set Point can be adjusted 12.6°F down or 5.4°F up from standard set point.

Note: Lo% = 75% for (K30,K40,K50), 63% for (K60), and 70% for (K80, K100)

Specifications[6] – Imperial Units

These models use the "G" control package										
Model			**CH-K**	**30**	**40**	**50**	**60**	**80**	**100**
Capacity	Cooling	High Fire	MBTUh	360	480	600	720	960	1200
		Low Fire	MBTUh	270	360	450	454	672	840
	Heating	High Fire	MBTUh	271	362	452	544	725	976
		Low Fire	MBTUh	204	271	339	342	507	683
	Cooling C.O.P.			1.1					1.02
	Capacity Control		(High / Low)	100% / 75%			100%/63%	100% / 70%	
Chilled / Hot Water	Cooling		°F	54.5 Inlet / 44.6 Outlet					
	Heating	Inlet	°F	123.3				123.6	122.9
		Outlet	°F	131.0					
	Rated Water Flow		GPM	72.6	96.8	121.0	145.1	193.5	241.9
	Evaporator Pressure Loss[2]		PSI	9.2				11.4	14.1
	Maximum Operating Pressure		PSI	150.0					
	Water Retention Volume		Gal	18.0	23.0	29.0	34.0	64.0	81.0
Cooling Water	Total Heat Rejection		MBTUh	631	842	1052	1264	1685	2176
	Inlet Temperature		°F	85.1					
	Outlet Temperature		°F	95.7				95.5	95.9
	Rated Water Flow[7]		GPM	120.8	161.0	201.3	241.5	322.0	402.5
	Condenser / Absorber Press. Loss[2]		PSI	9.9			12.8	9.2	14.9
	Maximum Operating Pressure		PSI	150.0					
	Water Retention Volume		Gal	38.3	47.6	62.1	78.2	108.6	141.1
Electrical	Power Supply			208V or 230V / 60 Hz / 3-Phase					
	Consumption[3]		Watts	900	1200	1250	1600	1800	2500
	Minimum Circuit Amps		Amps	14.0	15.9		18.0	18.6	
	MOCP – Max. Fuse Size		Amps	15	20				
Burner	Burner Input[1]	High Fire	MBTUh	327	436	545	655	873	1176
		Low Fire	MBTUh	245	327	409	413	611	823
	Supply Gas Pressure		Inches W.C.	5 – 10.5" w.c.				7 – 10.5" w.c.	
	Type			Forced Draft with Category I Venting					
	Gas			Dedicated: Natural or Propane. Not convertible.					
	Ignition Type			Intermittent or Interrupted Spark					
	Flame Detection			Optical or UV Scanner					
Construction	Dimensions	Width	Inches	57.5		70.1		72.4	
		Depth[5]	Inches	60.6		70.1		74.8	
		Height[4]	Inches	79.1				94.5	
		Height w/VC	Inches	96.1				111.1	
	Weight	Dry	Lbs	3950	4230	5090	5310	7500	8600
		Operating	Lbs	4475	4860	5990	6330	9105	10450
	Cabinet			NEMA 3R, Silver Metallic Pre-Painted Hot Dip Zinc-Coated Sheet Steel					
	Noise Level		dB(A)	63	62	64	67		
Piping	Chilled / Hot Water		Inches	2 NPT	2-1/2 NPT		3 NPT	4 Flanged	
	Cooling Water		Inches	2-1/2 NPT	3 NPT			5 Flanged	
	Gas		Inches	1-1/2 NPT		2 NPT		2-1/2 NPT	
	Flue Diameter		Inches	6.3		7.1			

NOTES:
1. Fuel input is based on the Higher Heating Value of gas. Burner efficiency = 83%.
2. Pressure Loss ratings are +/- 10%.
3. Power Consumption does not include external pumps or cooling tower fan motors.
4. "Height" does not include level bolts, but "Height with VC" includes both vent cap and the level bolts.
5. "Depth" does not include Junction Box. Add 3.9" to Depth Dimension to include Junction Box.
6. Specifications are based upon water in all fluid circuits and fouling factor of 0.0005 ft^2-hr-°F/Btu.
7. Minimum cooling water flow is 100%.

YAZAKI

Specifications[6] – Metric Units (all values converted from Imperial Units)

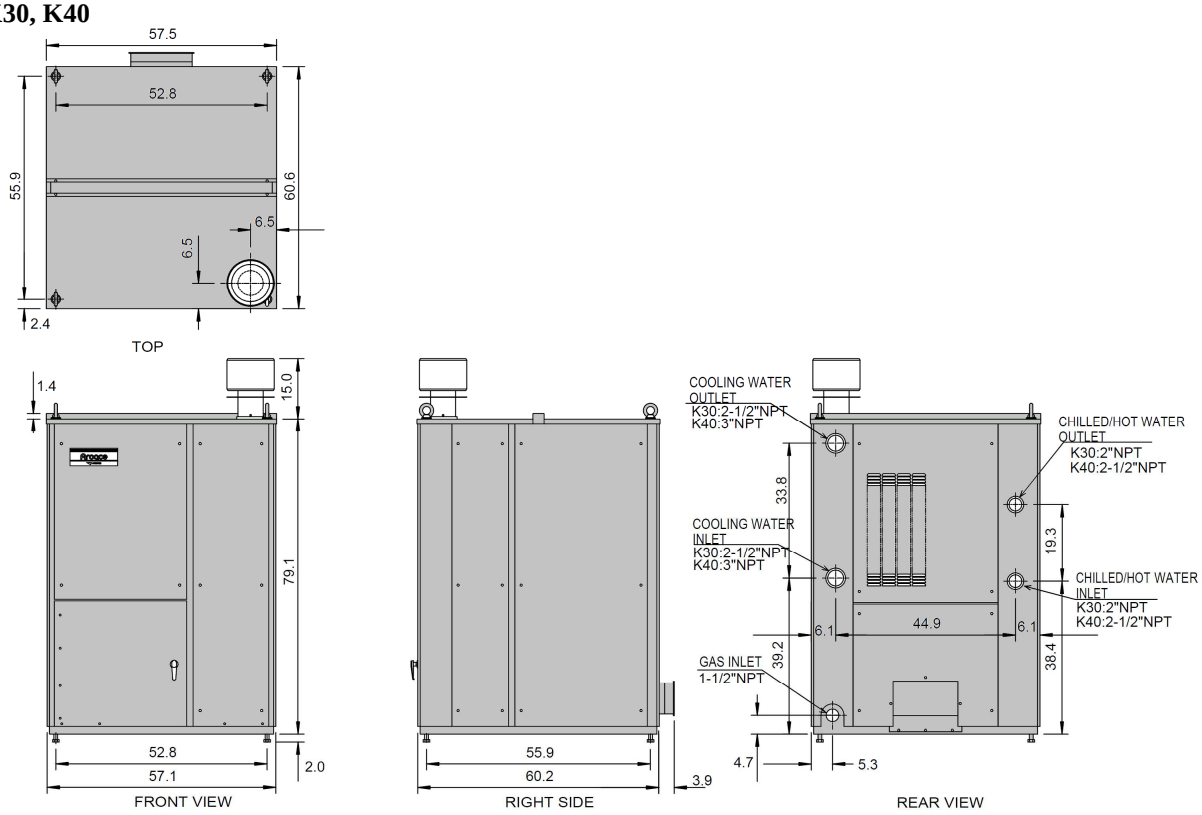
These models use the "G" control package

Model			**CH-K**	**30**	**40**	**50**	**60**	**80**	**100**
Capacity	**Cooling**	**High Fire**	**kW**	106	141	176	211	281	352
		Low Fire	**kW**	79	106	132	133	197	246
	Heating	**High Fire**	**kW**	80	106	133	159	212	286
		Low Fire	**kW**	60	80	99	100	149	200
	Cooling C.O.P.			1.1					1.02
	Capacity Control		**(High / Low)**	100% / 75%			100%/63%	100% / 70%	
Chilled / Hot Water	**Cooling**		**°C**	12.5 Inlet / 7.0 Outlet					
	Heating	**Inlet**	**°C**	50.7				50.9	50.5
		Outlet	**°C**	55.0					
	Rated Water Flow		**l/sec**	4.6	6.1	7.6	9.2	12.2	15.3
	Evaporator Pressure Loss[2]		**kPa**	63.4				78.6	97.2
	Maximum Operating Pressure		**kPa**	1034					
	Water Retention Volume		**liters**	68	87	110	129	242	307
Cooling Water	**Total Heat Rejection**		**kW**	185	247	308	370	494	638
	Inlet Temperature		**°C**	29.5					
	Outlet Temperature		**°C**	35.4				35.3	35.5
	Rated Water Flow[7]		**l/sec**	7.6	10.2	12.7	15.2	20.3	25.4
	Condenser / Absorber Press. Loss		**kPa**	68.3			88.3	63.4	103
	Maximum Operating Pressure		**kPa**	1034					
	Water Retention Volume		**liters**	145	180	235	296	411	534
Electrical	**Power Supply**			208V or 230V / 60 Hz / 3-Phase					
	Consumption[3]		**Watts**	900	1200	1250	1600	1800	2500
	Minimum Circuit Amps		**Amps**	14.0	15.9		18.0	18.6	
	MOCP – Max. Fuse Size		**Amps**	15	20				
Burner	**Burner Input[1]**	**High Fire**	**kW**	96	128	160	192	256	345
		Low Fire	**kW**	72	96	120	121	179	241
	Supply Gas Pressure		**kPa**	1.25 – 2.6				1.75 – 2.6	
	Type			Forced Draft with Category I Venting					
	Gas			Dedicated: Natural or Propane. Not convertible.					
	Ignition Type			Intermittent or Interrupted Spark					
	Flame Detection			Optical or UV Scanner					
Construction	**Dimensions** (note #4: Height) (note #5: Depth)	**Width**	**mm**	1460		1780		1840	
		Depth[5]	**mm**	1540		1780		1900	
		Height[4]	**mm**	2010				2400	
		Height w/VC	**mm**	2440				2820	
	Weight	**Dry**	**kg**	1792	1919	2309	2409	3402	3901
		Operating	**kg**	2030	2204	2717	2871	4130	4470
	Cabinet			NEMA 3R, Silver Metallic Pre-Painted Hot Dip Zinc-Coated Sheet Steel					
	Noise Level		**dB(A)**	63	62	64	67		
Piping	**Chilled / Hot Water**		**Inches**	2 NPT	2-1/2 NPT		3 NPT	4 Flanged	
	Cooling Water		**Inches**	2-1/2 NPT	3 NPT			5 Flanged	
	Gas		**Inches**	1-1/2 NPT		2 NPT		2-1/2 NPT	
	Flue Diameter		**mm**	160		180			

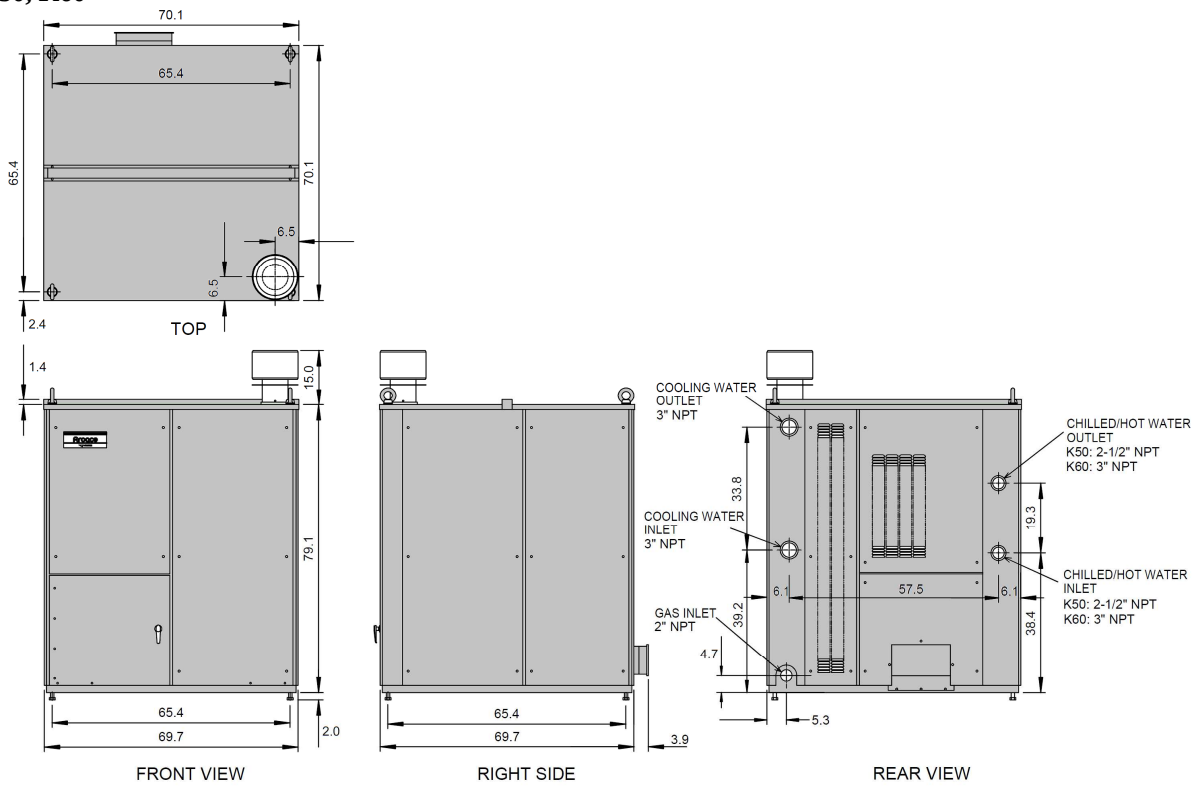
NOTES:
1. Fuel input is based on the Higher Heating Value of gas. Burner efficiency = 83%.
2. Pressure Loss ratings are +/- 10%.
3. Power Consumption does not include external pumps or cooling tower fan motors.
4. "Height" does not include level bolts, but "Height with Vent Cap" includes both vent cap and the level bolts.
5. "Depth" does not include Junction Box. Add 3.9" to Depth Dimension to include Junction Box.
6. Specifications are based upon water in all fluid circuits and fouling factor of 0.0005 ft^2-hr-°F/Btu.
7. Minimum cooling water flow is 100%.

Dimensions (CH-K Series)

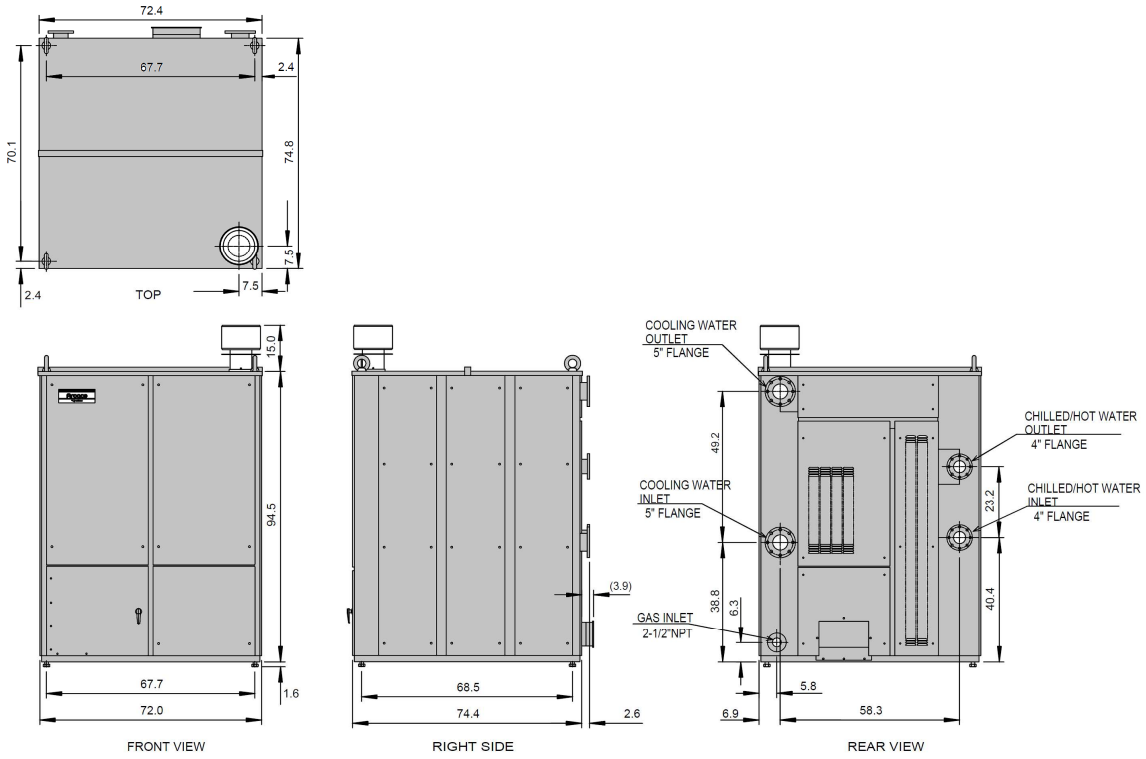
CH-K30, K40



CH-K50, K60



CH-K80, K100



For information concerning service, operation
or technical assistance, please contact your
Yazaki Authorized Service Provider or the following:

YAZAKI ENERGY SYSTEMS, INC.
542 HAGGARD STREET, SUITE 502
PLANO, TEXAS 75074-5562
Phone: 469-229-5443
Fax: 469-229-5448
Email: yazaki@yazakienergy.com
Web: www.yazakienergy.com

c UL us
LISTED

This symbol on the product's nameplate means it is listed by
UNDERWRITERS LABORATORIES, INC.

GUIDE SPECIFICATIONS

30 – 80 RT

K-SERIES GAS-FIRED, DOUBLE-EFFECT ABSORPTION CHILLER-HEATER

1. General Description

The Contractor shall furnish and install _____ (QTY) Yazaki model **CH-K____** Gas-Fired, Double- Effect Absorption Chiller-Heater(s) as shown on the drawings and in accordance with these specifications.

2. Chiller-Heater Operating Conditions

MODEL	ITEM		SPECIFICATIONS	
			COOLING	HEATING
CH-K____	*Capacity (MBH)			
	Gas	Type (Natural or Propane)		
		*Input (MBH)		
		*Line Pressure (in. wc.)		
	Chilled/Hot Water	*Inlet Temperature (°F)	54.5	
		*Outlet Temperature (°F)	44.6	131.0
		*Flow (GPM)		
		*Pressure Loss (PSI)		
	Cooling Water	*Inlet Temperature (°F)	85.1	
		*Outlet Temperature (°F)		
		*Flow (GPM)		
		*Pressure Loss (PSI)		
	Electrical	*Power Supply	( )V, 60 Hz, 3-ph	
		*Consumption (W)		

* Refer to Product Brochure for specifications

NOTES: 1. MBH = Btu/hr x 1000

2. Performance based on Japanese Refrigeration and Air Conditioning Industry standards with minimum fouling factor of 0.0005 ft².Hr.°F/BTU in the evaporator, condenser, and absorber water circuits.

3. Construction

Each absorption chiller-heater shall be manufactured in accordance with JIS B8622 (Japanese Industrial Standard). The chiller-heater shall be a modular, single-shell, hermetic design using lithium bromide as the absorbent and water as the refrigerant. Two generators – one directly heated by a gas burner and the other heated by hot refrigerant vapor – an evaporator for chilled/hot water, and a water-cooled condenser/absorber shall be the main components in the double-effect absorption chiller-heater. Leak testing, charging with solution, and performance testing of each absorption chiller-heater shall be completed in the factory prior to shipment. All cold and hot surfaces shall be insulated.

The absorber, condenser, evaporator, and low temperature generator shall be formed in circular bundles with multi-pass circuits and designed to accommodate thermal expansion and contraction during normal service. Heat exchangers for chilled/hot water and cooling water shall be constructed from copper tubing and suitable for a maximum working pressure of 85 PSIG. Evaporator tubing shall be externally enhanced to increase heat transfer. Steel ring trays with drippers shall rely upon gravity to uniformly distribute liquid refrigerant and solution over the evaporator and absorber tube bundles. The high-temperature generator shall be constructed from corrosion-resistant steel and fire tubes with stainless steel baffle plates shall ensure maximum heat transfer from the exhaust gas. A plate-type solution heat exchanger, constructed from stainless steel, shall be an integral component for enhancing the absorption cycle efficiency.

Each absorption chiller-heater shall undergo a series of factory tests to ensure that the vacuum section is leak-tight and meet the manufacturer's strict quality control standards. The chiller-heater shall be covered with a helium-charged bell and the vacuum section shall be evacuated to 0.02 micron Hg absolute. The leakage rate measured by helium mass spectrometer shall not exceed $5x10^{-10}$ atm.cc/sec.

A forced draft-type burner with integral blower, combustion air damper, gas pressure regulator, shutoff valves, 6kV ignition system, and flame safeguard controls shall be assembled and tested on each absorption chiller-heater at the factory. The combustion head shall incorporate a multi-port stainless steel diffuser.

A motorized cooling/heating changeover valve shall be factory-supplied and field installed on the absorption chiller-heater and shall be controlled by a HEAT-COOL selection switch on the chiller-heater control panel or from a remote switch. The position of the changeover valve shall not change in the event of power failure.

Each double-effect absorption cycle of the chiller-heater shall only require one variable-speed hermetic pump motor assembly of all-welded steel construction to circulate. No other pumps should be needed or present for the double-effect absorption cycle.

A palladium cell heater shall be provided to automatically purge small quantities of hydrogen from the absorption cycle. An auxiliary absorber shall function during cooling operation to continuously purge non-condensable gases from the main absorber and store them in a storage chamber where they cannot affect the chiller-heater performance. The storage chamber capacity and integrity of the vacuum system shall be such that evacuation, every 1000 hours or greater during the cooling period, shall maintain the chiller-heater performance.

The chiller-heater design shall allow the solution to drain under gravity and prevent crystallization in the event of a power failure.

All external piping and wiring connections shall be located on the same side of each absorption chiller-heater.

A vent cap for outdoor installation, eyebolts for lifting, leveling bolts, and mounting plates shall be supplied with the equipment.

Each absorption chiller-heater shall be enclosed in a UL50E Type 3R cabinet suitable for indoor or outdoor installation without modification.

A lockable hinged door shall be provided in the front for service access.

Each absorption chiller-heater shall be listed by Underwriters Laboratories, Inc., as "Absorption Air Conditioning Equipment", suitable for both indoor and outdoor installation.

4. Internal Controls

Each absorption chiller-heater shall be supplied complete with factory wired and mounted controls located inside a weatherproof cabinet. The controls shall include the following items:

a) Electronic temperature measurement of cooling water inlet and outlet, chilled/hot water inlet and outlet, liquid refrigerant, generator, and condenser surface.

b) Solid-state controls and pre-programmed microprocessor

c) Burner controller suitable for intermittent or interrupted spark ignition and optical or UV flame detection.

d) Motor contactor and overload relay for the solution pump

e) Control relays with dry contacts for signaling the operation of the chilled/hot water pump and cooling water pump.

f) Control relay with dry contacts for signaling the operation of the cooling fan so that it will engage the tower fan when the entering cooling water temperature reaches 84.2°F and will disengage the tower fan when the entering cooling water falls to 80.6°F.

A control panel built into each absorption chiller-heater shall provide the following status lamps and manual controls:

a) Alarm reset.

b) Navigable display using Up and Down Buttons that lists:

1) Generator Temperature
2) Solution Pump Run Hours
3) Current Error Code
4) Leaving Chilled/Hot Water Temperature
5) Cooling Enabled Hours
6) Heating Enabled Hours
7) Cooling Combustion Hours
8) Heating Combustion Hours

c) Status lamps for Power, Chiller ON, Chiller OFF, Cool mode, Heat mode, Freeze Protection, Standby mode, Burner Firing, and Chiller Failure.

d) Heating and Cooling mode switches.

e) Remote, On, and Off mode switches with status lamps.

f) RUN, OFF, and FAILURE status lamps for the solution pump.

A junction box shall be provided for field connections to the power supply, low voltage control circuits for the chilled/hot water pump, cooling water pump, cooling tower fan, and external control interlocks. Junction box shall also provide for field connections to 24v, 60VA dry contact feedback circuits that indicate Cool Mode, Heat Mode, Chiller Enabled, and Chiller Alarm.

The refrigeration capacity of the absorption chiller-heater shall be controlled, in response to chilled/heated water outlet temperature, by step-modulating the gas burner at a low-fire rate which is dependent upon tonnage selection (75% for 30, 40, and 50 ton units, 63% for 60 ton units, and 70% for 80 ton units at design conditions) and a high fire rate of 100%.

The following abnormal operating conditions shall safely shut down the gas-fired absorption chiller-heater:

a) Burner failure (low combustion airflow, ignition failure, etc.)

b) High temperature in the generator.

c) High cooling water temperature.

d) Entering cooling water temperature below 46.4°F.

e) High evaporator temperature after 30 minutes of operation.

f) Freezing evaporator.

g) Low solution level.

h) Major condenser fouling.

i) Open sensor circuit.

j) Abnormal changeover valve position.

k) Solution pump overload relay tripped.

l) Chilled/hot water pump overload relay tripped.

m) Cooling water pump overload relay tripped.

n) Cooling tower fan overload relay tripped.

o) Low chilled/hot water flow.

p) Triggering of field-supplied optional fire safety interlock.

q) Triggering of field-supplied optional seismic switch.

5. External Controls (Supplied by Others)

If there is a tendency for the cooling water temperature leaving the cooling tower to fall below 65°F during normal operation, a 3-way temperature control valve shall be installed and set to maintain the cooling water above 65°F (minimum).

If cooling water remains in the chiller-heater during heating operation and the chiller-heater is used for frequent cycling between heating and cooling operation, the 3-way temperature control valve shall be forced open for 1 minute each time the cooling operation is selected so that “hot” cooling water is bypassed to the cooling tower sump.

Motor contactors, overload relays, auxiliary relays, and AUTO-OFF-MANUAL switches for the chilled/hot water pump, cooling water pump, and cooling tower fan shall be furnished and installed by the contractor.

6. Interlocks

The thermal overload relays for the chilled/hot water pump, cooling water pump, and cooling tower fan shall be interlocked with the chiller-heater controls via normally-closed contacts on auxiliary relays. In the event of a pump or fan overload, the auxiliary relay contact shall open and shut down the chiller-heater.

7. Installation

The water quality in the chilled/hot water and cooling water circuits shall not exceed the following limits:

	ITEM	CHILLED/HOT WATER	COOLING WATER	MAKE-UP WATER
Standard	pH (at 77°F)	6.8 - 8.0	6.5 - 8.2	6.8 - 8.0
	Conductivity (μS/cm at 77°F)	400	800	300
	Chloride ion (Cl^- ppm)	50	200	50
	Sulfate ion (SO_4^{2-} ppm)	50	200	50
	M-alkalinity ($CaCO_3$ ppm)	50	100	50
	Total hardness ($CaCO_3$ ppm)	70	200*	70
	Calcium hardness ($CaCO_3$ ppm)	50	150	50
	Ionic silica (SiO_2 ppm)	30	50	30
Reference	Total iron (Fe ppm)	1.0	1.0	0.3
	Copper (Cu ppm)	1.0	0.3	0.1
	Sulfide ion (S^{2-} ppm)	ND	ND	ND
	Ammonium ion (NH_4^+ ppm)	1.0	1.0	0.1
	Residual chlorine (Cl ppm)	0.3	0.3	0.3
	Free carbon dioxide (CO_2 ppm)	4.0	4.0	4.0
	Ryzner stability index	-	6.0 - 7.0	-

NOTES:
1. ND (Not Detectable)
2. *Maximum total hardness of make-up water shall not exceed 70 ppm when bleed off is the only method used to control water quality.

Each absorption chiller-heater shall be installed on a level, non-combustible surface. Leveling bolts shall be placed on mounting plates and adjusted for longitudinal and transverse alignment of the chiller-heater shell using the level bar of the chiller-heater as the reference point.

Thermowells or temperature test points, similar to P/T plugs, shall be installed on the inlet and outlet water piping to each absorption chiller-heater.

The absorption chiller-heater shall be installed in a location where there is access to all side and top panels. A minimum of 40” clearance shall be provided to the front of the equipment. Piping configuration shall allow for clear access to the absorption chiller-heater for service to both the rear and the side of the equipment.

Balancing valves shall be installed in all external water circuits to adjust the flow to within the following tolerances:

a) 80 – 120% of rated chilled/hot water flow per the “Pressure Drop in Unit” tag.

b) 100 – 120% of rated cooling water flow per the “Pressure Drop in Unit” tag.

A suitable field-supplied gas meter shall be installed to measure gas consumption and appliance regulators shall be installed to ensure that the gas supply pressure at each absorption chiller-heater meets the manufacturer's specifications.

When installed indoors, a barometric damper shall be installed on each chiller-heater and vent extensions shall conform to all applicable codes for Category I Appliances with Fan-Assisted Type-B gas vents.

A fused disconnect switch shall be furnished and installed in the power supply circuit to each absorption chiller-heater unit.

8. Options and Accessories

Factory Installed Options that shall be furnished if specified on the equipment schedule:

1. Cooling Water Flow Switch (FS2).
2. High Pressure Fluid Circuits, 114 PSI (785 kPa).
3. High Pressure Fluid Circuits, 142 PSI (985 kPa).
4. Horizontal Rigging Modifications so unit may be turned onto its side during rigging. This is not for horizontal transport to installation jobsite.
5. WTI Sensor to monitor chilled/hot water inlet temperature.

9. Startup and Warranty

An Authorized Service Provider (ASP) shall start up and provide routine maintenance on each absorption chiller-heater. The Contractor shall provide personnel familiar with the system design and controls. Startup supervision is an available option from the manufacture.

Installation and Operating Instructions shall be provided with each absorption chiller-heater.

The warranty on each gas-fired double-effect absorption chiller-heater shall commence on the date of initial startup. Warranty period expires 1 year after startup or 24 months beyond the date of manufacture, whichever comes first. Extended warranty on the vacuum section may be available from the manufacture on qualifying installations.

WARRANTY

YAZAKI LIMITED EXPRESS WARRANTY

1. **SCOPE OF COVERAGE.** The Limited Express Warranty of Yazaki Energy Systems, Inc. ("YESI") applies to the initial retail purchaser and assigns ("CUSTOMER") of Yazaki double-effect chiller-heaters and water-fired chillers and chiller-heaters ("PRODUCT") installed in the U.S.A., Canada, and all other countries within the YESI sales territory at the time of sale of the PRODUCT. The initial retail purchaser may assign its rights under this Limited Express Warranty to any third party with prior written consent by YESI which shall not be unreasonably withheld by YESI.

2. **GENERAL EXPRESS WARRANTIES.** YESI warrants to the CUSTOMER, that the PRODUCT shall be free from defects in material and workmanship which are discovered and reported in writing to YESI within the period of one (1) year ("Original Warranty Period") from the time when the PRODUCT is initially placed into operation at the CUSTOMER's facility ("Start-Up Date"), or two (2) years from the date of manufacture, whichever expires first, and subject to the disclaimers and limitations of this Limited Express Warranty.

As a condition of this Limited Express Warranty, the CUSTOMER shall arrange at its own cost for annual routine maintenance of the PRODUCT, prior to cooling operation and prior to heating operation of the PRODUCT, by a service provider authorized by YESI, in accordance with the Yazaki Operating and Maintenance Instructions.

This is not a warranty of performance, but a limited warranty as to the condition of the PRODUCT at the Start-Up Date.

3. **DISCLAIMER AND LIMITATION OF EXPRESS WARRANTIES.** There are no express warranties other than those contained in this Limited Express Warranty.

4. **WARRANTY REGISTRATION CARD.** Every new PRODUCT is accompanied by a Warranty Registration Card which shall be completed, signed by an authorized representative of the CUSTOMER, and returned to YESI. This Limited Express Warranty shall not apply unless the Warranty Registration Card is fully completed and returned to YESI within thirty (30) days of the Start-Up Date of the PRODUCT.

5. **WARRANTY SERVICE.** All routine maintenance, parts replacement, and vacuum section repairs of the PRODUCT during the Original Warranty Period must be performed by a service provider authorized by YESI.

   To obtain warranty service, contact:
   - **a.** The Service Provider indicated on the Warranty Registration Card, or if that person is not available;
   - **b.** YESI's Distributor or Sales Representative from whom the PRODUCT was purchased, or if that person is not available;
   - **c.** Yazaki Energy Systems, Inc.

6. **REMEDY DURING ORIGINAL WARRANTY PERIOD.** YESI shall, at its sole discretion, repair or replace the PRODUCT or parts there-of which YESI shall determine upon examination to be defective or not in conformity with the Original Warranty contained herein ("Defective Part"), subject to the terms hereof.

   YESI shall supply by standard ground transportation all parts required to repair or replace any Defective Part and shall pay the authorized service provider the necessary and allowable labor charges as fixed in YESI's warranty service payment schedule in effect from time to time ("Fixed Labor Charges"). The CUSTOMER shall be solely responsible for all labor costs or charges in excess of the Fixed Labor Charges. A copy of the current Fixed Labor Charges for warranty service can be obtained by an authorized service provider upon written request to YESI.

7. **LIMITATION OF WARRANTY AND LIMITATION OF REMEDY.** CUSTOMER's remedies shall be limited (even in the event of YESI's default of its warranty obligations) exclusively to those provided in section 6 of this Limited Express Warranty. UNDER NO CIRCUMSTANCES SHALL YESI BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES. If the limitation of liability fails the essential purpose, CUSTOMER's liability shall be expanded to the minimum extent to avoid failure of the essential purpose. Customer waives any cause of action or theory of liability including, but not limited to, those arising under contract, tort, strict liability, product liability, statutes, or otherwise, except as specifically provided by the UCC as modified and limited herein.

   The warranty period of all replacement parts and PRODUCTS shall be deemed to commence on the Start-Up Date of the original PRODUCT, not the installation date of the replacement part or PRODUCT, and YESI's warranty obligation hereunder shall not be extended by virtue of such replacement.

8. **DISCLAIMER OF IMPLIED WARRANTIES.** YESI DISCLAIMS ALL IMPLIED WARRANTIES (OTHER THAN GOOD TITLE) INCLUDING, BUT NOT LIMITED TO, THOSE OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, AND NON-INFRINGEMENT. There are no warranties which extend beyond those express warranties contained in this Limited Express Warranty. CUSTOMER affirms that it has not relied upon YESI's skill or judgment to select or furnish PRODUCT for any particular purpose. YESI does not warrant that the PRODUCT complies with the requirements of any safety or environmental code or regulation of any federal, state, municipality, or other jurisdiction beyond the specific express warranties in this Limited Express Warranty.

9. **SPECIFIC EXCLUSIONS.** In addition to all other exclusions contained in this Limited Express Warranty, YESI's warranty shall also not apply under the following circumstances:

   - **a.** Damage to the PRODUCT caused by an un-authorized service provider;
   - **b.** Defect in any part not supplied or authorized by YESI;
   - **c.** Installation or operation of the PRODUCT in any way not described in the applicable Yazaki Installation and Operating Instructions;
   - **d.** Applications for process cooling (except single-effect absorption chillers);
   - **e.** Failure to provide routine maintenance of the PRODUCT by a Yazaki-authorized service provider in accordance with the applicable Yazaki Operating and Maintenance Instructions;
   - **f.** Failure to maintain the quality, flow, and supply temperature of the cooling water in accordance with Yazaki standards and limitation;
   - **g.** Damage caused to the PRODUCT from freezing, overpressure, and corrosion in any water circuit;
   - **h.** Misuse, abuse, negligence, accident, natural disaster, alteration, misapplication, or experimental use of the PRODUCT;
   - **i.** Normal fading and minor deterioration of the cabinet surface caused by exposure to the elements;
   - **j.** Removal of the PRODUCT from its original installation site unless the relocation is approved in writing by YESI prior to the act of relocation;
   - **k.** Materials, such as inhibitor and batteries, that are consumed during normal operation of the PRODUCT;
   - **l.** Damage to other products outside the PRODUCT, not supplied by YESI, caused by use of materials that are not compatible with the operating characteristics of the PRODUCT, regardless of the absence of specific instructions in Yazaki Installation and Operating Instructions.